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(51) INT CL⁷

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H4J JK J36Q

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GB 2309830 A	EP 0735698 A2	EP 0661824 A1
EP 0650282 A1	EP 0624021 A2	WO 98/09414 A
JP 080009004 A	JP 020069056 A	US 5497506 A
US 5166695 A		

(58) Field of Search

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INT CL⁶ H01Q 1/10 1/24, H04B 1/38, H04M 1/02 1/03
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(54) Abstract Title

Telephone handset with at least two movable elements whose motion is linked or is initiated by pushbutton or incoming call

(57) A telephone handset (1) comprising a stationary element and a plurality of movable elements (4, 6), at least two of the movable elements being movable, relative to the stationary element, between a closed position when the phone (1) is not in use, and an open position when the phone (1) is in use, respectively, whereby moving one of the elements (4) between its closed and open positions causes another of the elements (6) to move between its closed and open positions automatically. In a preferred embodiment, the movable elements (4, 6) comprise a keypad and an antenna respectively of a mobile telephone.

The movable parts may be linked by pulleys, rack and pinion, rollers and friction surfaces or electrical means.

In another embodiment the motion of the movable elements is initiated by pressing a button or receiving a call.

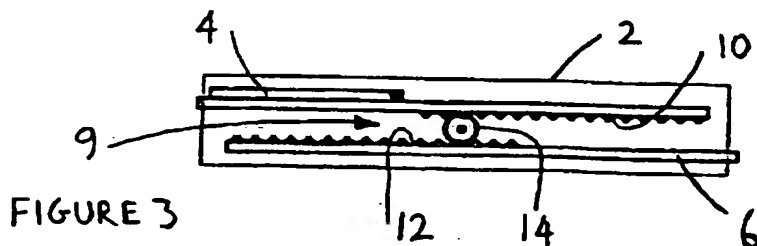


FIGURE 3

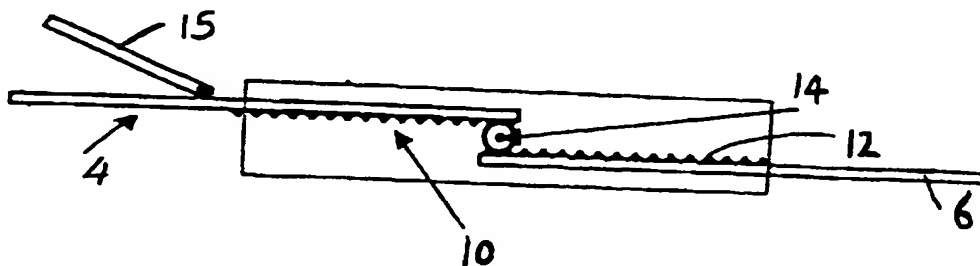


FIGURE 4

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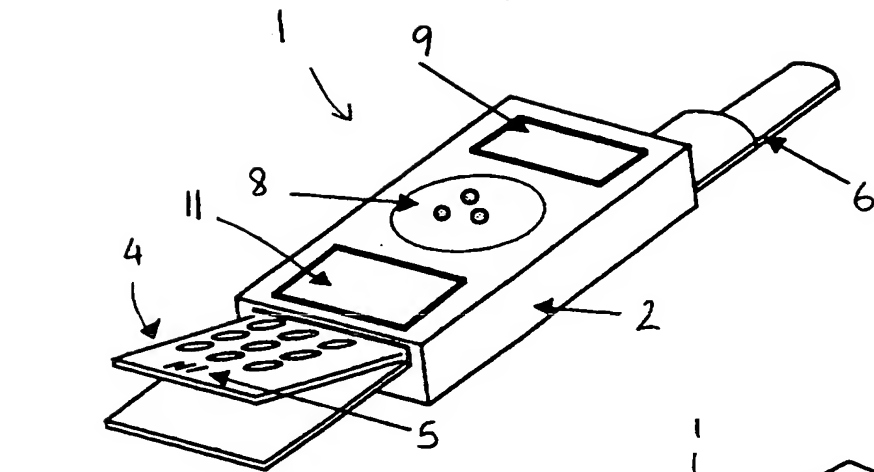


FIGURE 1

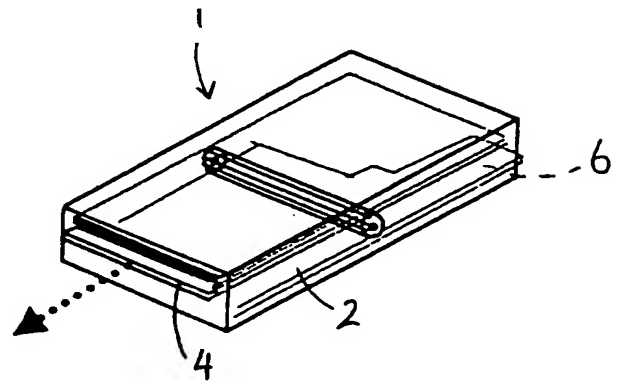


FIGURE 2

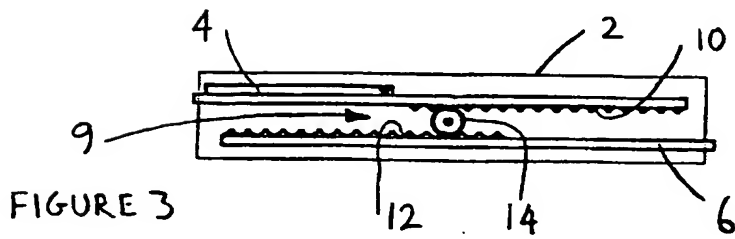


FIGURE 3

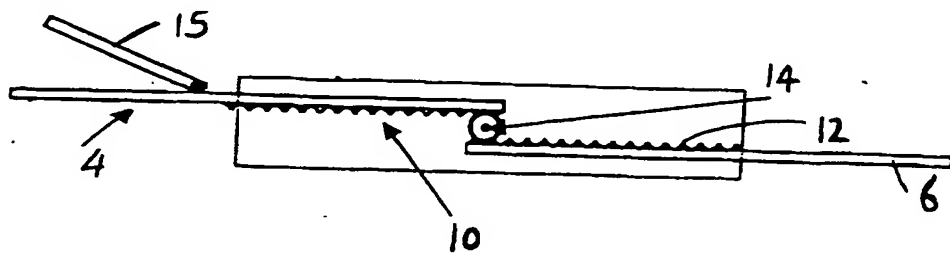


FIGURE 4

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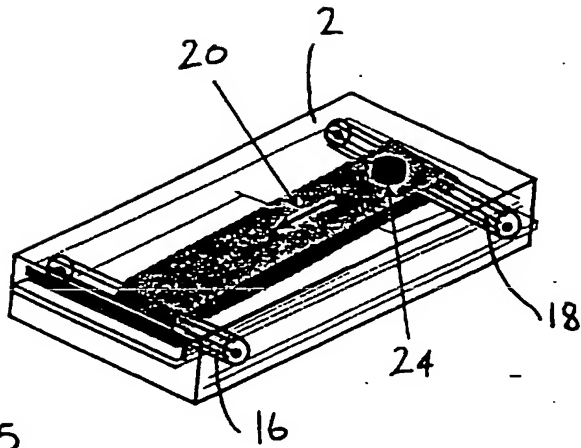


FIGURE 5

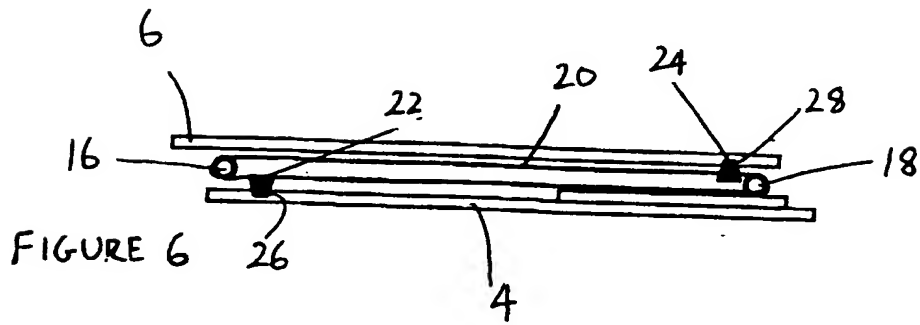


FIGURE 6

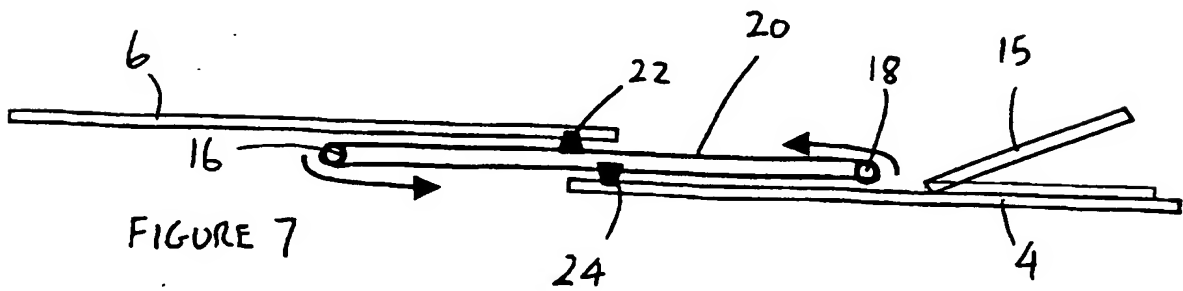


FIGURE 7

STRETCH TELEPHONEField of invention

5 The invention relates to a telephone handset which is compact when not in use, yet is easily deployed into a larger, more user friendly, size when in use.

Background

10 With the continuous size reduction in modern electronics, mobile phones have been shrinking in size. It has now reached a point where the size of the phone is ideal for carrying around. However, while the reduced size makes the phone more convenient to carry,
15 it does not make the phone comfortable to use.

 Various attempts have been made to produce phones which are compact when not in use, but which are enlarged when being used. For example, mobile phones
20 are known which have single pivoting or sliding elements that extend the length of the phone when in use.

 Another feature that effects the size of a phone is the antenna. Many phones are known to have antennae
25 that are stored within the phone when not in use, and deployed when a caller wishes to make or receive a call. An antenna which is stored in this manner has the advantage of reducing the length of the phone for
30 storage, and also reducing the likelihood of damaging the antenna.

 However, having more than one extendable element



means that the user has to perform a number of tasks when answering or making a call. For example, the user has to firstly slide or flip open one part, (for example the keypad or microphone), and then extract a
5 second part, (for example, an antenna or ear-piece).

The aim of the present invention is to overcome this disadvantage by having a phone which is both compact when not in use, yet simple to transform into
10 the extended length mode when making or receiving a call.

Summary of the invention

15 According to a first aspect of the present invention, there is provided a telephone handset comprising at least two movable elements which are movable between a closed position when the phone is not in use, and an open position when the phone is in use,
20 whereby moving one of the movable elements between its closed and open positions, causes another of the movable elements to move between its closed and open positions automatically.

25 According to a second aspect of the present invention there is provided a telephone handset comprising at least two movable elements which are movable between a closed position when the phone is not in use, and an open position when the phone is in use,
30 means being provided to automatically move the movable elements between their open and closed positions on receipt of an incoming call or in response to the actuation of a switch or button.

Preferably, the telephone handset further comprises a stationary element, which may comprise a main body of the telephone handset, each movable element being movable between its closed and open positions relative to the stationary element.

Preferably, there is a mechanical interconnection between the movable elements. For example, the movable elements may each have a respective toothed rack and may be interconnected by a rotating pinion which is engaged with the racks, whereby moving the said one movable element between its closed and open positions, causes the pinion to rotate, which in turn causes the said other movable element to move between its closed and open positions. Preferably each rack is integrally formed with a respective movable element.

In an alternative arrangement, the movable elements may each have a respective friction surface and may be frictionally engaged with a rotating wheel or roller, whereby moving the said one movable element between its closed and open positions causes the wheel or roller to rotate which in turn causes the said other movable element to move between its closed and open positions.

Preferably, the friction surfaces are formed from, or coated with, a material or finish having a coefficient of friction which is greater than that of the material from which the movable elements are made.

Preferably, the wheel or roller is provided with a tyre made from a material having a coefficient of friction which is greater than that of the material

from which the wheel or roller is made.

5 Preferably, the pinion, wheel or roller is
pivotably connected to a housing of the telephone
handset.

Preferably, one of the elements is a keypad and
another of the elements is an antenna.

10 Preferably, one of the movable elements contains a
microphone and another of the movable elements contains
an earpiece.

15 Preferably, one of the movable elements is
resiliently biased, such that it tilts towards the
mouth or ear of a user when moving from its closed to
its open position. This has the advantage of providing
the optimum positioning of the movable element in
relation to the user.

20 Preferably, the movable elements are biased into
their closed positions and are locked by a locking
device in their open positions, so that releasing the
locking device causes the movable elements to return
25 automatically to their closed positions. This has the
advantage of enabling the phone to be returned to its
compact standby state in one easy action.

30 Preferably, when closed, the keypad is protected,
so that the keys cannot be pressed inadvertently.

Preferably, the telephone handset referred to
above is a mobile telephone.

Brief description of the drawings

For a better understanding of the present
5 invention and to show how the same may be carried into
effect reference will now be made, by way of example,
to the accompanying drawings, in which:-

10 Figure 1 shows a mobile phone in its open position;

Figure 2 is a view of the internal structure of a
mobile phone in its closed position;

15 Figure 3 is a diagrammatic representation of a rack and
pinion mechanism of the mobile phone of Figures 1 and 2
in the closed position;

20 Figure 4 is a diagrammatic representation of a rack and
pinion mechanism of the mobile phone of Figures 1 and 2
in the open position;

25 Figure 5 is a view of the internal structure of an
alternative embodiment of mobile phone in the closed
position;

Figure 6 is a diagrammatic representation of a belt and
pulley mechanism of the mobile phone of Figure 5 in the
closed position; and

30 Figure 7 is a diagrammatic representation of a belt and
pulley mechanism of the mobile phone of Figure 5 in the
open position.

Detailed description of the invention

Referring to Figure 1, a mobile phone 1 comprises a housing 2 which houses the circuitry of the phone 1 and in which is formed an earpiece 8 and phone displays 9, 11. In the housing 2 are received a first movable element 4 in the form of a keypad having a mouthpiece 5, and a second movable element 6 in the form of an antenna. When the phone 1 is engaged on a call, the keypad 4 and antenna 6 are both fully extended from the housing 1.

When the phone is in standby mode, as shown in Figure 2, the keypad 4 and antenna 6 are both stored within the housing 2 of the phone 1. This has the advantage of making the phone 1 compact and easy to carry around.

Figures 3 and 4 show the rack and pinion mechanism that is used to simplify the opening of the phone from the closed position to the open position. In a preferred embodiment, the keypad 4 and antenna 6 are provided with respective toothed racks 10, 12. The racks 10, 12 are coupled by a pinion 14 which is rotatably supported in the housing 2. When the user of the phone pulls the keypad 4 to remove it from the housing 2, the toothed rack 10 is drawn over the pinion 14, causing it to rotate. Since the pinion 14 is also engaged with the toothed rack 12 of the antenna 6, the antenna 6 is driven in the opposite direction to the keypad 4, and is therefore ejected automatically to the open position. In this way both the keypad 4 and the antenna 6 are extended simultaneously in response to a

single opening operation from the user.

Referring to Figure 4, the keypad 4 is of two part construction and comprises the toothed rack 10 and a
5 flip up keyboard 15 which is hinged to the toothed rack 10, and is resiliently biased to rotate away from the toothed rack 10 by a coil spring (not shown). When the keypad 4 is within the housing 2 of the mobile phone 1, the keyboard 15 is held down against the toothed rack
10 10. However, as the keypad 4 is withdrawn from the housing, the keyboard 15 is able to gradually pivot away from the toothed rack 10 until abutment of appropriate stops (not shown) limits its pivoting movement. With the keyboard 15 pivoted away from the
15 toothed rack 10, the mouthpiece 5 is placed in a better position relative to a mouth of the user of the phone. A similar arrangement could be used to tilt an earpiece, if this was formed on a movable element of the mobile phone 1.

20

It will be appreciate that the user may open the phone in the reverse manner by pulling open the antenna 6 rather than the keypad 4. As the antenna 6 is withdrawn from the housing 2, the rack and pinion
25 mechanism will operate to eject the keypad 4 from the housing 2.

In an alternative embodiment (not illustrated), the toothed racks 10, 12 and pinion 14 are replaced by
30 friction surfaces formed on the keypad 4 and the antenna 6 and a corresponding drive wheel or roller. In this simplified embodiment, the driving connection between the keypad 4 and antenna 6 and the drive wheel is a simple friction connection which may be enhanced

by fitting the wheel with a rubber tyre and providing a rubber coating on the keypad 4 and antenna 6 where they engage the drive wheel.

5 Figures 5 to 7 illustrate an alternative embodiment of the invention in which the rack and pinion mechanism is replaced by a pair of rollers 16, 18 which are pivotally connected to the housing 2 and are drivingly interconnected by a resilient belt 20. 10 The belt 20 is provided with a pair of anchor points 22, 24 which are best shown in Figures 6 and 7. The anchor points 22, 24 comprise tapering projections which engage in corresponding recesses 26, 28 formed in a first movable element 4 (comprising the keypad and 15 mouthpiece 5) and a second movable element 6 (comprising the antenna).

As in the embodiments of Figures 1 to 4, the first movable element 4 is of two part construction and 20 comprises a flip-up keyboard 15 which is hinged to the first movable element, and is resiliently biased to rotate away from the first movable element 4 by a coil spring (not shown).

25 Referring to Figure 6, in use of the telephone handset, if the first movable element is withdrawn from the housing 2, the engagement of the tapered projection 26 in the first movable element 4 transmits the movement of the first movable element 4 to the drive 30 belt and causes it to rotate around the rollers 16, 18. This in turn causes the second tapered projection 28 and the second movable element 6 into which it is engaged, to move in the opposite direction to the first movable element 4 and thereby be ejected from the

housing 2. It will be appreciated that if the second movable element 6 is withdrawn from the housing 2, the first movable element 4 will be ejected in a similar fashion.

5

When the first movable element 4 is within the housing 2 of the mobile phone 1, the keyboard 15 is held down against the first movable element 4. However, as the first movable element 4 is withdrawn from the housing 2, the keyboard 15 is able to gradually pivot away from the first movable element 4 until abutment of appropriate stops (not shown) limits its pivoting movement. With the keyboard 15 pivoted away from the first movable element 4, the mouthpiece 5 is placed in a better position relative to a mouth of a user of the phone.

In an alternative embodiment (not illustrated) an electrical switch or sensor may be provided which is activated by movement of one of the movable elements between its closed and open positions. When activation of the electrical switch or sensor occurs, an electrically powered means such as a motor moves the other movable element between its closed and open positions. In the simplest embodiment, the pinion 14, drive wheel or roller(s) may be driven to rotate by the electric motor in response to activation of the switch or sensor.

In an alternative arrangement (not illustrated) pressing a button or receiving an incoming call triggers the electrically powered means to move the movable elements between their closed and opened positions automatically. For example, the pressing of a button or the receipt of an incoming call may

activate the electrical switch or sensor which is responsive to the movement of the movable elements, thereby triggering the electrically powered means.

5 Although embodiments have been described which refer specifically to a movable keypad and antenna, it is to be understood that other elements of the phone may be drivingly interconnected. For example, the present invention is applicable to

10

1. a "flip" type phone in which opening the flip rotates a pinion wheel or roller, which causes an antenna to extend;

15

2. a "banana" type phone in which sliding open the cover rotates a pinion, wheel or roller, which causes an antenna to extend.

20

Furthermore, embodiments are contemplated in which operation of any of the above components by an operator not only extends an antenna, but also extends an earpiece. Alternatively, such operation may extend the earpiece or mouthpiece only, or may extend some other element of the phone such as a display, cover or guard.

25

CLAIMS

1. A telephone handset comprising at least two
movable elements, which are movable between a closed
5 position when the phone is not in use, and an open
position when the phone is in use, means being provided
to automatically move one of the movable elements
between its closed and open positions, in response to
movement of another of the movable elements between its
10 closed and open positions.

2. A telephone handset comprising at least two
movable elements, which are movable between a closed
position when the phone is not in use, and an open
15 position when the phone is in use, means being provided
to automatically move the movable elements between
their open and closed positions on receipt of an
incoming call or in response to the activation of a
switch or button.

20 3. A telephone handset as claimed in claim 1 or
2, further comprising a stationary element, each
movable element being movable between its closed and
opened positions relative to the stationary element.

25 4. A telephone handset as claimed in any one of
the preceding claims, in which the said automatic
moving means comprises a mechanical interconnection
between the movable elements.

30 5. A telephone handset as claimed in any one of
the preceding claims, wherein the movable elements each
have a respective toothed rack and are interconnected

by a rotating pinion which is engaged with the racks,
whereby moving the said other movable element between
its closed and open positions, causes the pinion to
rotate, which in turn causes the said one movable
5 element to move between its closed and open positions.

6. A telephone handset as claimed in claim 5, in
which each rack is integrally formed with the
respective movable element.

10 7. A telephone handset as claimed in any one of
claims 1 to 4, wherein the movable elements each have a
respective friction surface and are frictionally
engaged with a rotating wheel or roller, whereby moving
15 the said other movable element between its closed and
open positions causes the wheel or roller to rotate,
which in turn causes the said one movable element to
move between its closed and open positions.

20 8. A telephone handset as claimed in claim 7, in
which the friction surfaces are formed from, or coated
with, a material or finish having a coefficient of
friction which is greater than that of the material
from which the movable elements are made.

25 9. A telephone handset as claimed in claim 7 or
8, in which the wheel or roller is provided with a tyre
or coating made from a material having a coefficient of
friction which is greater than that of the material
30 from which the wheel or roller is made.

10. A telephone handset as claimed in any one of
claims 1 to 4, in which the movable elements are linked
by a band and pulley system, such that moving the said

other of the movable elements between its closed and open position causes the said one of the movable elements to be pulled, via the band and pulley system, between the closed and open positions.

5

11. A telephone handset as claimed in any one of claims 5 to 10, in which the pinion, wheel, roller or pulley is pivotably connected to a housing of the telephone handset.

10

12. A telephone handset as claimed in any one of the preceding claims, in which the said means comprises an electrical interconnection between the movable elements.

15

13. A telephone handset as claimed in any one of the preceding claims, in which the said automatic moving means comprises an electrical switch or sensor which is activated by movement of the said other element between its closed and opened positions.

20

14. A telephone handset as claimed in claim 13, in which the said automatic moving means further comprises electrically powered means for moving the said one element between its closed and open positions in response to activation of the electrical switch or sensor.

25

15. A telephone handset as claimed in claim 14, in which the electrically powered means comprises an electric motor.

30

16. A telephone handset as claimed in any one of the preceding claims, in which one of the movable

elements is a keypad and another of the movable elements is an antenna.

5 17. A telephone handset as claimed in any one of the preceding claims, in which one of the movable elements contains a microphone and another of the movable elements contains an earpiece.

10 18. A telephone handset as claimed in any one of the preceding claims, in which one of the movable elements is resiliently biased, such that it tilts towards the mouth or ear of a user when moving from its closed to its open position.

15 19. A telephone handset as claimed in any one of the preceding claims, in which the movable elements are biased into their closed positions and are locked by a locking device in their open positions.

20 20. A telephone handset substantially as described herewith with reference to and as shown in the accompanying drawings.

25 21. A mobile phone comprising a telephone handset as claimed in any one of the preceding claims.



Application No: GB 9912316.8
Claims searched: 1,3-21

Examiner: Owen Wheeler
Date of search: 16 August 1999

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H1Q (QKC) H4J (JK)

Int Cl (Ed.6): H01Q: 1/10, 1/24; H04B: 1/38; H04M: 1/02, 1/03;

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2330032 A [NEC] See in particular Figs. 2,3	1,3-6,10-11,16
X	GB 2309830 A [NEC] See in particular Figs. 1,2	1,3-6,10
X	EP 0735698 A2 [NEC] See in particular Figs. 5,6	1,3,4
X	EP 0661824 A1 [NEC] See in particular Figs. 2,3	1,3,4
X	EP 0650282 A1 [AT+T] See in particular Fig. 3	1,3-6,18
X	EP 0624021 A2 [NEC] See in particular Figs. 7-10	1,3-6,10-11
X	US 5166695 A [CHAN] See in particular Fig. 1 and column 2 lines 17-36.	1,3-6
X	JP 020069056 A [MATSUSHITA] See abstract.	1,3,4

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P Document published on or after the declared priority date but before the filing date of this invention.
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Application No: GB 9912316.8
Claims searched: 2

Examiner: Peter Easterfield
Date of search: 23 November 1999

Patents Act 1977
Further Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.Q): H1Q (QKC) H4J (JK)
Int Cl (Ed.6): H01Q:1/10, 1/24; H04B:1/38; H04M: 1/02, 1/03;
Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2330237 A (ERICSSON)	2,4,5,6,16
X	GB 2329760 A (SAMSUNG) See figs 12, 13	2,4,12,13, 14,15,16
X	JP 8009004 A (NEC)	2,4,16
X	US 5497506 A (KAKEN)	2,4,12,13, 14,15,16
X	WO 98/09414 A (BELLSOUTH)	2,4,12,16, 17

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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